

that it was evidently still in an embryonic state, mentioned some examples of the conflicting and contradictory statements made by different authorities as to its electrical resistance. These varied from 13,000 to 2875 ohms and less. He believed it was enormously overstated, and had for this reason applied himself to make some more accurate determinations. He was at once met by three obstacles:—(1) The difficulty of making good contact through the skin of a living man. (2) The limitation of the amount of current by pain, and by the fact that the rapid opening and closing of strong circuits produced a tetanic state of muscle. (3) The fact that the human body is an easy electrolyte, almost immediately furnishing currents of polarisation.

As regards (1), the axiomatic statement seemed to be that the poles must be infinitely large compared with the current they had to conduct. This condition he had attempted to fulfil in five different ways, two at least of which were successful: either by immersing the feet and hands in baths of brine in contact with an electrode of amalgamated lead or zinc of from fifty to a hundred square inches surface, or by soaking these extremities in brine, and then wrapping a strip of flexible lead two feet long by two inches wide about them, after the fashion of a surgical spiral bandage. The fact that the skin resistance was thus reduced to zero was proved to demonstration by an observation already recorded in NATURE (September 13, p. 463), from which it appeared that the resistance of a corpse, treated with the spiral leaden bandages from foot to foot was 1150 ohms, and with solid silver conductors thrust three inches deep into the plantar muscles was actually 50 ohms more.

Under the heading of contacts it was essential to determine definite anatomical points from which the measurements should start, and which readily admitted of linear verification. Such points existed in the prominence of the ulna at the inner side of the wrist, and the lower edge of the external malleolus at the ankle. The shortest course traversed by the current between these two points had been measured to a quarter of an inch.

There were three principal directions in which determinations had been made:—

1. From hand to hand.
2. From foot to foot.
3. From hand to foot.

No. 1 was much the same as the height of the subject, and was not liable to great variation.

No. 2 varied more, since the difference between very tall and shorter men lies chiefly in the legs.

No. 3 was perhaps the best test of the average conductivity of the body, since looped currents were sure to traverse the whole trunk, and even caused motor disturbance in the extremities not included in the circuit.

Three such observations were given, including one on a man of the exceptional height of nearly 8 feet.

As regards pain, it was noted that the E.M.F. used varied from three to ten bichromate cells of 1·8 volts each. Even the first was occasionally complained of, thus incidentally showing the goodness of the contact obtained. In morbid conditions, such as that termed myxedema, the E.M.F. of 10 cells or 18 volts through a resistance of only 1260 ohms was easily borne, and indeed hardly felt. The third difficulty, that namely of electrolysis, was the most serious: indeed the particular metal of which the electrodes were made sank into insignificance compared with the rapid and vigorous polarisation of the moist tissues of the body itself. A rotating commutator on Wheatstone's plan, and afterwards a metronomic instrument, by which the periods of alternation could be varied, were first used, but with only partial success. A more delicate mode of discharging was found in the use of an ordinary commutator key worked like a piano with the index and middle fingers of the left hand; a double contact key, putting battery and galvanometer successively in circuit, being beneath the right index finger. The left keys being first depressed alternately, the right key produced a double deflection, while the bridge resistance was too low, which was replaced by an opposite double deflection when it was intentionally made too high. By watching the galvanometer a point was easily found where it ceased to "throw," and then three successive contacts in either direction were taken to determine resistance. In spite of all precautions, the second measurement was sometimes a little in excess of the first, owing to a polarisation-current assisting the battery. This, however, never amounted to more than about five ohms, and was easily allowed for. Between each set of observations a short-circuit key, inserted outside the bridge,

was closed for at least a minute, so as to discharge patient, bath, and electrodes.

The measurement was then repeated with inverted current, and the mean taken.

One set of examples out of many was read to the meeting. Three men of very different heights were tested according to the following table:—

	Height.	Weight.	Ulna to malleolus.	Foot to foot.	Foot to hand.
	ft. in.	st. lb.	ft. in.		
1. Mr. Todd ...	5 6 ...	7 13 ...	5 9½ ...	945 ...	1320
2. Mr. Shackel ...	6 3 ...	13 0 ...	7 0 ...	930 ...	1027
3. Hungarian Giant ...	7 8	8 7 ...	930 ...	1032½

Two of these were students at St. Thomas's Hospital; the third an Austrian now exhibiting at the Aquarium, and kindly lent to the writer for examination. All the three were singularly strong, healthy, well proportioned men, of active athletic habits. An interesting illustration of physiological laws here incidentally cropped out, showing that, in the normal human body considered as a machine, as is the length of the osseous levers so is the sectional area of the motor muscles. This in the present instance results in an almost complete identity of the electrical resistance, increased length being very fairly balanced by increased sectional area in the conductor. A good test of morbid leanness or fatness might probably be founded on this identity.

A few words only were given to the variations of human resistance in disease and with alteration of temperature. The latter have already appeared in the columns of NATURE (on June 14 and September 13).

As regards the former, six cases of hemiplegia were cited: three on the right and three on the left side of the body, in all of which the paralysed was found less resistant than the healthy side, in amounts varying from 120 to 730 ohms. The only case which differed from this rule was that of a worker in copper, from whose secretions three milligrammes of metallic copper had been extracted, where the cupreous impregnation obviously modified the general resistance of the body, as the writer had found it to do in the case of lead and mercury also.

A confirmation of the view already expressed by the writer of the paper, that the human body follows the law of solid rather than that of fluid conductors under changes of temperature, had occurred in the instance first quoted (June 14, p. 151), where the occurrence of dropsical effusion in the lower extremities permanently reduced the resistance from the values originally given, the lowest of which was 2300, to 750 ohms.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

TEN lectures on the diseases of field and garden crops will be delivered by Mr. Worthington G. Smith, F.L.S., before the Institute of Agriculture, British Museum, South Kensington, during the week November 12-17. The lectures will be illustrated with actual examples, and new drawings of all the diseases from nature, uniformly enlarged to 1000 and 5000 diameters.

UNIVERSITY COLLEGE, ABERYSWYTH.—Mr. J. Brill, B.A., St. John's College, Cambridge, has been appointed lecturer to assist the Professor of Mathematics at this college. Mr. Brill was fourth wrangler in January 1882, and, we understand, had the honour of being one of the selected candidates for the Professorship of Mathematics at the University College, Cardiff.

SCIENTIFIC SERIALS

Revue d'Anthropologie (deuxième et troisième fascicules), Paris, 1883.—In the earlier of these two numbers M. Topinard continues the "Elementary Description of the Cerebral Convolution in Man, in accordance with the Schematic Brain designed by Paul Broca." This is the second of the series of explanatory instructions begun in the January number. It ends with a description of the occipital fissures, peculiar to man, the simiæ, and lemurs, which Broca termed "scissure occipitale interne" and "scissure occipitale externe." In the simiæ the former of these is generally perpendicular, while in man it is often oblique in direction and irregular in position, rendering its determination difficult.—Under the title "*Transformisme*," a term used by French anthropologists for *Darwinism*, M. Mathias Duval gives the substance of his introductory lecture at the Anthropological School at Paris at the opening of the session of 1881-82. The lecturer, after giving a general idea of "transformism," passes in review the services rendered to the modern science of evolution by Darwin's precursors, Lamarck and Etienne Geoffroy Saint-Hilaire. Next he considers the re-

searches and theories of Darwin, the objections which have been made to some of his deductions, and the evidence and facts which can be brought to support his theory, with reference specially to the importance of the labours of Haeckel and other contemporary naturalists, who have contributed to the development of the Darwinian doctrines, while he lastly draws attention to the various applications of these views beyond the sphere of natural science, strictly so called.—In a paper on the Iroquois Indians Dr. Ten Kate has embodied the most important results of his observations on the physical and social condition of the pure redskins and half-breeds whom he has lately visited in the Indian reservation lands to the west of New York State. He found very few among them of pure Indian descent, but some exhibited a certain degree of prognathism, recalling the same characteristic as seen among the Malayan Liplaps. The average height of the men is 1.75 m., with a greater corresponding length of limb than is usual in whites or mulattoes. They are dolichocephalic. The colour of the eyes is reddish-brown, unlike that of any other race, while the complexion of the children is sometimes as light as that of an Italian. The half-breeds only have beards. Their principal illnesses are of a scrofulous character. The Iroquois dialects, which are gradually dying out, have not hitherto been reduced to writing, owing to the numerous anomalous guttural sounds which belong to them.—M. Bérenger-Féraud contributes an interesting paper on marriage among the negroes of Senagambia. As elsewhere among Africans, the parental tie is slight, divorce is common, women are virtual slaves, and marriages are attended with elaborate ceremonials simply as pretexts for amusements and intemperance.—M. Mondière in a review of the different races of Indo-China, supplies us with many interesting details in regard to the ethnological and anthropometrical characteristics of the Tonquins, Cambodians, and Laos, as well as of the less unfamiliar populations of Siam and Burmah.—In the third number of this year's *Revue*, we have the concluding part of Broca's description of the cerebral convolutions and fissures, which deals specially with the frontal lobes.—M. M. Duval continues his lectures on "*Transformisme*," carrying down his analysis of the most important works on the Darwinian theory of evolution to the sociological and psychological views of Herbert Spencer, and the biological researches of Huxley.—Investigations into the nature of several supernumerary muscles in the antero-internal scapular region, by Dr. L. Testut. After Cruvilhier, who first drew attention to some of these muscles, Knott and Macalister in Ireland, and Gruber in Germany, among others, have pointed out the not infrequent occurrence of these anomalous structures in man, while in the elephant and bear, and in some of the lower quadrumana, a supernumary caraco humeral and brachial are almost always present.—The so-called "*Maie*," or May Queen of Provence, is described by Dr. Bérenger-Féraud, who traces back the festival, by which the return of the month of May is celebrated in Southern France to the ancient cult of Maia, the mother of Mercury, among the founders and Greek colonists of Marseilles. In modern times the worship of the Pagan Maia has been transferred to the Virgin Mary, in whose name alms are solicited for the little girl-child, who, veiled, and nearly buried in flowers, is supposed to represent the much venerated "*Notre Dame du Mai*" of Provence. These Provencal May festivals are thus closely allied to the so-called "*floral games*," which still survive in Cornwall, and repeat on each 8th day of May some part of the ancient Roman worship of the goddess Flora.—M. Deniker passes in review the results of the travels of M. Miklouho-Maclay on the east coasts of New Guinea, and summarises the information derived from his careful study of the Papuan races of the island, giving at the same time a number of important anthropometric measurements, together with numerous interesting ethnological and social data.

Zeitschrift für wissenschaftliche Zoologie, Band xxxviii. Heft 3, July, 1883, contains: On the embryology of *Planaria polychroa*, by Dr. E. Metschnikoff (plates 15 to 17).—On the Cœlenterata of the Southern Ocean, part 3. On the Nematophores of Plumularidæ, and on urticating cells in the mesoderm (Schirmgallerte) of *Crambessa mosaika*, by Dr. R. von Lendenfeld (plate 18).—On Karyokinesis in some Protozoa, by Dr. A. Gruber (plate 19) (*Actinosphaerium eichhornii* and *Amœba princeps*).—Contributions to a knowledge of the development of the Gastropods, by Dr. F. Blochmann (plates 20, 21).—On the glands of the mantle-edge in *Aplysia* and kindred forms, by Dr. F. Blochmann (plate 22).—Contributions to a knowledge of the Medusæ, by Dr. Otto Hamann (plate 23).—On the cerebrum of

birds, by Dr. A. Bumm (plates 24, 25).—On *Girardinus caudimaculatus*, by Dr. Hermann von Ihering (plate 26). An interesting study of this little limnophagous Cyprinoid found in Rio Grande do Sul.—Contribution to technical histology, by Prof. H. Fol.

Heft 4, August, 1883, contains: On the Cœlenterata of the Southern Ocean, part 4. On *Eucopella campanularia*, a new genus belonging to the Campanularidæ, by Dr. R. von Lendenfeld (plates 27 to 32). This memoir consists of a very elaborate and detailed description of both the hydrosome, gonophore, and ova of this new species.—On the eggshell (*Eihaut*) of *Python bivittatus*, with remarks on some other reptile eggs, and on the genesis of their outer layers, by W. von Nathusius-Königsborn (plates 33, 34).—Researches on some new Medusæ from the Red Sea, by Dr. C. Keller (plates 35 to 37).—On the manner of propagation in *Proteus anguineus*, by Marie von Chauvin (plate 38).

Archives Italiennes de Biologie, tome iii. fasc. ii. May 20, 1883, contains:—On medical instruction in Italy, by Prof. J. Bizzozero.—On the sanitation of the Roman Campagna, by C. Tommasi-Crudeli.—On the therapeutic effect of prolonged tepid baths in pneumonia and typhoid fever, by C. Bozzolo.—On the structure and affinities of the olfactory lobes in the higher Arthropods and the vertebrata, and on a contribution to the histogenesis of the internal molecular layer of the retina, by G. Bellonci.—On organic particles in the air of high regions, by P. Giacomini.—On the action of cotoine and paracotoine, by P. Albertoni.—On lung epithelium and its transformations in disease of that organ, by C. Bozzolo and B. Graziadei.—On the comparative anatomy of the skull of the Terramare pig, by Prof. P. Strobel.—On ptomaines, by J. Guareschi and A. Mosso.

Fasc. iii. July 31, 1883, contains:—On the partial regeneration of the liver, by G. Tizzoni and V. Colucci.—On the presence of cystoliths in some Cucurbitaceæ, by O. Penzig (plate).—On the histology of the nervous centres, by C. Golgi (4 plates).—On the action of iodoform in saccharine diabetes, by C. Bozzolo.—On the normal structure and on alteration caused by experiment in the pacinian corpuscles of birds, by Josephine Cattani.—On negro anatomy, by Prof. C. Giacomini: (1) on the cartilage of the semi-lunar fold in the eye; (2) Graafian follicles.—On the development in Salpa, by Prof. F. Todaro.—On some experimental researches as to a new automatic centre in the bulbo-spinal tract, by Dr. J. Fano.—Anthropometric studies of criminals, by Prof. H. Ferri.—On the anatomical merits of Jerome Fabrizi d'Acquapendente, by Prof. G. Romiti.—On the secretion of bile, by Dr. B. Baldi.—On inoculation of leprosy, by R. Campana.

Proceedings of the Isis Natural History Society, Dresden, January to June, 1883.—Obituary notice of Karl Ch. G. Nagel, by H. Engelhardt.—Perceptive faculty of insects and other lower animals, by Prof. B. Vetter.—Fauna of the Suez Canal, by Dr. C. Keller. Up to the present time eleven Mediterranean species have penetrated for the most part as far as Suez, while the Red Sea yields twenty-five species, which, however, have as a rule scarcely yet reached half way towards the northern entrance.—On a case of albinism observed in the Heidelberg district, by H. Engelhardt.—A comparative study of the flora of the Erzgebirge and Riesengebirge, by Dr. R. Kell.—On the theory of shifting continental and insular climates, with special reference to the vegetable relations of Norway, by Cl. König.—On the so-called "*compass plants*," by E. Stahl.—On the exploration of the flora of Lapland made by Linné in 1732, by Dr. O. Drude.—On the presence of Anodonta and Planorbis in the Tertiary lignite beds of Schefflenken, by Dr. Deichmüller.—On the source of the nephrite found in North Germany, by H. Credner.—On the river valley formations in the Western Erzgebirge, by J. Jacobi.—On the geological formations of Mittweida, with special reference to its flora, by R. Beck.—On a fossil bird from the Bohemian chalk beds, by H. B. Geinitz.—On the presence of copper in the syenite of the Plauenscher Grund, Saxony, by F. Zschau.—On the limits of the Dyas and Trias systems, by A. Dittmarsch.—On the relation of the protoarseniate of iron to the iron oxide in the magnetic iron ore of Berggieshübel, by H. Vater.—On G. Laube's "*Traces of Man in the Quaternary Formations of the Prague District*," by Dr. Deichmüller.—On the bronze and iron objects found in the clay beds of the Wendish Circle, Lievland, by A. Engelmann.—On H. Schliemann's "*Ilios, City and Land of the Trojans*," by H. B. Geinitz.—On a prehistoric find on the Hradisch near Stradonitz, by W. Osborne.—On an ancient burial place at Kunzowo, by F. Raspe.—Find of stone axes at Dippoldiswald, by H. Wiechel.—Or

some new views respecting the mutual relations of biological and chemical research, by D. W. Hentschel.—On Prof. Lindemann's proof that π is not an algebraic quantity, by Dr. Harnack.—On the preparation and application of perspective models in relief, by Dr. Burmeister.—On the general theory of the so-called P.E. system, by Prof. Voss.—On the supposed coprolite deposits of Helmstadt, Büddenstedt, and Schleweke, near Harzburg, by Dr. H. B. Geinitz.—Memoir on the diluvial glaciers of North Europe, with special reference to Saxony, by Dr. H. B. Geinitz.—A Gaanlish double grave at La George-Maillet, Marne, by D. von Biedermann.—Monograph on the climate of the Glacial epoch, by Heinrich Vater.—The diamond fields of the Cape, by Thaddeus Schrader.

SOCIETIES AND ACADEMIES LONDON

Mineralogical Society, October 22.—Anniversary Meeting.—W. H. Hudleston, F.G.S., president, in the chair.—The following were elected officers and Council for the coming session:—President, Rev. Prof. Bonney, F.R.S. Vice-Presidents: Rev. S. Houghton, M.D., F.R.S.; W. H. Hudleston, M.A., F.G.S. Council: G. S. Boulger, F.G.S.; C. O. Trechmann, Ph.D., F.G.S.; Mr. J. Stuart Thomson, Rev. Prof. Wiltshire, F.G.S. (in place of Messrs. Church, Danby, Merry, and Walker). Treasurer, R. P. Greg, F.G.S. General Secretary, R. H. Scott, M.A., F.R.S. Foreign Secretary, C. Le Neve Foster, D.Sc., F.G.S. The Secretary read the Report, which was adopted. The outgoing President delivered a short address, and the chair was taken by Prof. Bonney, when the following papers were read:—J. Stuart Thomson, on crystals of calamine from Wanlockhead.—A. S. Woodward, on the occurrence of Evansite in East Cheshire.—Mr. S. Henson exhibited a magnificent group of crystals of stibnite from Japan.—A vote of thanks to the outgoing president, Mr. Hudleston, concluded the proceedings.

SYDNEY

Royal Society of New South Wales, September 5.—C. Moore, F.L.S., vice-president, in the chair.—Five new members were elected, and eighty-nine donations received. The following papers were read:—Notes on the genus *Macrozamia*, with descriptions of some new species, by C. Moore, F.L.S.—A list of double stars, by H. C. Russell, B.A., F.R.A.S.—Some facts connected with irrigation, by H. C. Russell, B.A., F.M.S., &c.—On models for showing crystallographic axes, by Prof. Liversidge, F.R.S.—On the discolouration of white bricks made from certain clays in the neighbourhood of Sydney, by E. H. Rennie, M.A., D.Sc.—Mr. J. K. Hume exhibited a collection of Carboniferous fossils from Cataract Creek near Mount Wellington, Hobart, Tasmania, which were described by C. S. Wilkinson, F.G.S.—Prof. Liversidge exhibited a fossil specimen of an extinct Chelonian reptile (*Notochelys costata*, Owen) from the Flinders River, Queensland, being the first Chelonian found in Australia.

PARIS

Academy of Sciences, October 22.—M. Blanchard, president, in the chair.—River navigation; endless chain towing, by M. Dupuy de Lome. The author describes the recent experiment made on the Rhone of a new system of towage, which appears satisfactorily to solve the problem of the economic transport of goods on this most difficult of navigable rivers, and, *a fortiori*, on all streams with a moderate current. The success of the experiments is due to the employment of two endless lateral chains, worked with independent machinery by a single hand, and serving at the same time to steer the vessel.—Note on a formula of Hansen applicable to the celestial mechanism (continued), by M. F. Tisserand.—Disinfection of ornamental plants intended for exportation, by M. Laugier. The successful experiments made in concert with Dr. Koenig of Asti at the Agronomic Station of Nice in December, 1882, were renewed during the month of September last with most satisfactory results.—Note on some arithmetical theorems, by M. Stieltjes.—On surfaces whose curve is constant, by M. G. Darboux.—On the law regulating the distribution of tension in an elastic plate of arbitrary primitive form encircling a cylinder of any right section, in cases where the friction is uniform, by M. H. Léauté.—On the movement of a rolling weight along an elastic horizontal rod fixed at both ends in cases where the mass of the rod is much smaller than that of the weight, by M. J. Boussinesq. A wider application is here shown of the problem of rolling masses

solved by Willis and Stokes, as described in the paper inserted by Stokes in the *Cambridge Phil. Trans.*, vol. viii. 1849.—Observations on a reply of M. Faye touching diverse phenomena of solar spectroscopy (*Comptes Rendus*, October 8, p. 779), by M. L. Thollon.—On the inductive force due to the variation of intensity in the electric current of a flat spiral multiplication, and on the comparison of this force with that exercised at great distances by a spherical solenoid or a solenoidal fictitious sun, by M. Quet.—Note on the determination of the equivalents of copper and zinc by means of their sulphates, by M. H. Baubigny.—On the transformation of hydrocarbons into corresponding aldehydes by means of chlorochromic acid, by M. A. Etard.—Note on the state of the sensitive nerves during the excitement produced by strychnine, by M. Couty.—On two cases of peripheral nervo tabes (ataxy of the lower members, combined with absolute integrity of the posterior roots, of the spinal ganglia and spinal marrow), by M. J. Dejerine.—On the secreting epithelium of the kidney of Batrachians (triton and axolotl), by M. J. Bouillot.—On the extent and age of the dioritic formations of Corsica, by M. Dieulaufait. Instead of occupying a deep continuous vertical range, as hitherto supposed, the author shows that the Corsican diorites belong to three distinct systems—granites at San Luccia di Tollano and Ajaccio, ophiolitic or serpentine rocks of the Triassic and Permian formations at Bastia and elsewhere. With these last are exclusively associated the numerous sulphuretted metalliferous ores occurring in the island.—A discussion of the causes to which is due the movement of glaciers, by Mr. Walter R. Browne. This movement is here attributed rather to atmospheric causes (pressure and temperature) than to gravitation.—Observations on an earthquake felt at Ghadames (Algeria) towards the end of last August, by M. Duveyrier.

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